

Prevalence and Factors Associated to Persistent Anemia among Pregnant Women in the Buea Health District, Cameroon

**Simon Eyongabane Ako^{1,2,3*}, Bimabam Josiah^{1,4}, Oscar Sakwe¹,
Tembong Neville¹ and Vicky Tankeu Ndassi^{1,4}**

¹*School of Health Science, Biaka University Institute of Buea, P.O.Box 77, Buea, SWR, Cameroon.*

²*Department of Medical Laboratory Science, Faculty of Health Sciences, University of Buea, P.O.Box 63, Buea, SWR, Cameroon.*

³*Infectious Disease Laboratory, Faculty of Health Sciences, University of Buea, P.O.Box 63, Buea, Cameroon.*

⁴*Department of Zoology and Animal Physiology, Faculty of Science, University of Buea, P.O.Box 63, Buea, SWR, Cameroon.*

Authors' contributions

This work was carried out in collaboration among all authors. Authors SEA and VTN designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors BJ, OS and TN managed the analyses of the study. Authors SEA and VTN managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IBRR/2021/v12i130142

Editor(s):

(1) Dr. Dharmesh Chandra Sharma, J. A. Groups of Hospital and G. R. Medical College, India.

Reviewers:

(1) Shweta Govind Patil, Maharashtra University of Health Sciences, India.

(2) Cuneyt Tetikkurt, Istanbul University-Cerrahpaşa, Turkey.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/60708>

Original Research Article

Received 20 July 2020
Accepted 04 September 2020
Published 15 February 2021

ABSTRACT

Introduction: Anemia in pregnancy represents a life-threatening but preventable reason for maternal and childhood morbidity and mortality. Although intervention measures are practiced in most affected countries like Cameroon, the impact of anemia on pregnant women is still apparent in most local communities. The relative contribution of sociodemographic related to anemia throughout gestation varies greatly and warrants investigation in urban and rural communities in developing countries, where the condition is most apparent.

Methods: A cross-sectional study design was carried out from February to July 2019 at six sites,

*Corresponding author: E-mail: simonako324@gmail.com;

Regional Hospital Buea, Bokwango Integrated Health Center (IHC), Buea - Road IHC, Buea town IHC, Molyko IHC, and Great Soppo IHC. A total of 408 pregnant women were enrolled in the study. The sociodemographic characteristics identified through questionnaires filled by the participants included age, marital status, educational status, occupation, gravida status, alcohol intake, iron folate intake, knowledge on anemia and crave for non-food substance. The clinical factors of participants gathered included previous records of diarrhea within the last 6 months, diagnosis for worm infection for the last 6 months, diagnosis for Malaria for the last 6 months. A blood sample was collected and analyzed with a haemoglobinometer (HemoCue 201+ system, Sweden). SPSS version 22 statistical package software was used to perform the data analysis. Factors related to anemia among participants unadjusted and adjusted odds ratios with their 95%CI were calculated using logistic regression models.

Results: The prevalence of anemia was 50 %. Among the anemic study participants 0.74 %, 11.76 %, and 37.50 % recorded severe, moderate, and mild levels of anemia respectively. The majority of the anemic participants 195 (95.6%) and 126 (61.8) had recently been diagnosed for Malaria and worm infections respectively. Craving for non-food substances (Calabar clay) and poor adherence to iron folate intake had a prevalence of 120 (58.8%) and 117 (57.4%) respectively. Multinomial logistic regression analysis showed that, irregular adherence to iron folate intake and reduce intake of iron folate frequency 2-3 times/week was statistically significantly associated with anemia ($p=0.0001$ and $p= 0.0001$ respectively). We equally observed a statistically significant association of alcohol drink consumption and craving for non-food substances (Calabar clay) with anemia ($p=0.004$ and $p=0.0001$ respectively). Cases of worm infection for the last 6 months were statistically significantly related to anemia ($p = 0.004$).

Conclusion: Anemia is high among pregnant women in the Buea health district. Factors associated with persistent anemia despite intervention measures in the community hospitals include malaria; no intake or reduced intake of iron folate; alcohol drinks consumption; craving for non-food substances (Calabar clay) and previously diagnosed worm infection within the last 6 months.

Keywords: Anemia; Buea; persistent; malaria; iron-folate; Calabar clay; alcohol; worm-infection.

1. INTRODUCTION

Anemia is a public health problem affecting the population of all age groups in both developed and developing countries. Its highest prevalence being among children aged <5 years and pregnant women. Globally, anemia affects 1.62 billion people (25%), out of which 56 million are pregnant women [1,2]. About 800 women a day are still dying from complications in pregnancy and childbirth globally [3]. Anemia during gestation represents a dangerous cause of maternal and childhood morbidity and mortality [4]. The health effects for the mother include fatigue, poor work capacity, impaired immune function, increased risk of cardiac diseases, and mortality [5-7]. Anemia in pregnancy is related to increased risk of Preterm birth and low birth weight babies [8,9], which are still the leading causes of neonatal deaths in developing countries like Cameroon contributing to 30% of deaths [10].

During pregnancy, the entire blood volume increases by about 1.5 liters [11]. The plasma volume increases more compared to red cell mass which resulting in hemodilution and

reduced hemoglobin concentration, this is often termed physiological anemia of pregnancy [11, 12]. According to the World Health Organization (WHO), anemia in pregnancy is when the Hb level is <11 g/dl. Anemia during pregnancy is taken into account severe when hemoglobin concentration (Hb) is a smaller amount than 7.0 g/dl, Moderate when it's 7.0 to 9.9g/dl and mild when it is 10.0 to 10.9g/dl [13].

Anemia during pregnancy contains a form of contributing factors including nutritional, infectious diseases, with iron deficiency accounting for 75% of anemia cases [14]. Other key determinants of anemia include maternal age, parity levels, trimester of pregnancy, rural residents [15]. The relative contribution of each of these factors to anemia during pregnancy varies greatly by geographical location, season, and dietary practice [16].

In Cameroon anemia is a severe public health problem in pregnancy [17,18]. The interventions implemented in Cameroon to reduce the burden of anemia during pregnancy include anemia screening during pregnancy and treatment, giving a mixture of the B complex (FeFo) and

iron supplements for 3 months, deworming, intermittent prophylaxis treatment for malaria (IPTp) with sulfadoxine-pyrimethamine (SP) from 14 weeks, free provision of mosquito treated nets, and health education during the antenatal visits. there's a necessity to know current data on anemia among pregnant women. Therefore this study aims to determine the prevalence and factors associated with anemia amongst pregnant women in the Buea health area.

2. METHODS

2.1 Study Design and Settings

A cross-sectional study design was conducted from February to July 2019 at six sites, Regional Hospital Buea, Bokwango Integrated Health Center (IHC), Buea - Road IHC, Buea town IHC, Molyko IHC, and Great Soppo IHC.

2.2 Inclusion and Exclusion Criteria

Pregnant women within the ages of 18 and 44 years and those who consented to participate in the study were included in the study. Those who were severely sick and anemic and hospitalized and those less than 18 years and greater than 44 were excluded from the study.

2.3 Sample Size Determination

The sample size was calculated using a single population proportion formula with the following assumptions: 95% confidence level, 5% margin of error, and 57% expected prevalence of anemia among pregnant women in the Buea Health District reported by Anchang et al. (2017). Given these assumptions the required sample size was found to be 377. But our study recruited 408 participants. A convenient sampling technique was used as only those who were willing, gave their consent after been informed about the study, and fulfilled the inclusion criteria were enrolled in the study.

2.4 Study Variables

2.4.1 Anaemia level

The anemia level was determined based on previous work by Anchang et al., 2017, wherein Hb concentration was expressed in grams per decilitres (g/dl). Anemia was defined as Hb value < 11 g/dl. Anemia severity was defined as follows: Mild anemia (Hb: 10 - 10.9 g/dl),

Moderate anemia (Hb: 7 - 9.9 g/dl), and Severe anemia (Hb < 7 g/dl).

2.4.2 Data collection instrument, sociodemographic and clinical characteristics of the participants

The sociodemographic characteristics identified through questionnaires filled by the participants include age, marital status, educational status, occupation, gravida status, alcohol intake and crave for non-food substance. Moreover, the clinical characteristics of participants gathered include previous records of diarrhea within last 6 months, diagnosis for worm infection for the last 6 months, diagnosis for Malaria for the last 6 months and their responses were confirmed through recent data taken from laboratory investigation sheets and other information sheets presented by the participants. Meanwhile, data on iron folate intake and knowledge on anemia was also collected through the questionnaire.

2.5 Blood Sample Collection

Each participant's third finger was cleaned using a wet alcohol swab and then allowed to dry. Using a sterile lancet the finger was pricked with a rapid puncture, sufficiently deep to allow the free flow of blood.

2.6 Laboratory investigation

Twenty (20) ul the second drop of blood was placed on and the strip inserted in a haemoglobinometer (HemoCue 201+ system, Sweden).

2.7 Method of Statistical Analysis

Data were entered using Microsoft Excel package software. After a thorough cleaning, the data was exported to SPSS version 22 statistical package software for further analysis. Descriptive statistics such as mean, standard deviations (SD), frequency, and percentage were used to describe the variables of the study. To describe factors associated with anemia among participants unadjusted and adjusted odds ratios with their 95%CI were calculated using logistic regression models.

3. RESULTS

3.1 Sociodemographic Characteristics

A total of 408 participants were recruited for the study. The median age range was between 18 to

26 years. The majority of the study participants were married 282 (69.1%). near half 174 (42.7%) of the study, participants did business as an occupation. About half the study participants 207 (50.7%) had secondary educational status. Also, the majority of the study participants 324 (79.4 %) did not consume alcoholic drinks for the last six months. The summary of the demographic data is shown in Table 1.

Table 1. Summary of the demographic data

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
18 – 26	174	42.7
27 – 35	162	39.7
36 – 44	72	17.6
Marital Status		
Single	123	30.2
Married	282	69.1
Divorced	3	0.7
Occupation		
Business	174	42.7
Farming	45	11
Student	72	17.7
Housewife	54	13.2
Civil servants	60	14.7
Unemployed	3	0.7
Education		
Primary	39	9.6
Secondary	207	50.7
Tertiary	162	39.7
Gravida		
Primigravid	108	26.5
Secundigravid	135	33.1
Multigravid	165	40.4

3.2 Clinical Characteristics

The mean Hb concentration ((\pm SD) was 11.88 \pm 9.937. With regards to study participant's previous records, 279 (68.4%), 393 (96.3%), and 18 (4.4%) had positive results on worm infection, malaria infection, and diarrhea occurrence respectively for the last 6 months. Further, we observed that 147 (36.0%) study participants did not adhere to iron folate intake recommended by their health service provider. Our study observed that 168 (41.2 %) of the study participants crave non-food substances (Calabar clay).

3.3 Prevalence of Anemia

The prevalence of anemia was 50 % (Table 2). Among the anemic study participants, 0.74 %,

11.76 %, and 37.50 % had a severe, moderate, and mild level of anemia, respectively (Fig. 1). The majority of the anemic participants 195 (95.6%) and 126 (61.8) had recently been diagnosed for Malaria and worm infections respectively. Participants who crave for non-food substances (Calabar clay) had a prevalence of 120 (58.8%). Further, poor adherence to iron folate intake among study participants had anemia prevalence of 117 (57.4%). Fig. 2 summarises the prevalence of anemia for the sociodemographic status of the study participants.

Table 2. Prevalence of anemia

Prevalence	Frequency	Percent
Negative	204	50
Positive	204	50
Total	408	

3.4 Risk factors Associated with Anemia Prevalence during Pregnancy in the Buea Health District

Multinomial logistic regression analysis showed that, irregular adherence to iron folate intake and reduce intake of iron folate frequency 2-3 times/week was statistically significantly associated with anemia ($p=0.0001$ and $p=0.0001$ respectively), with an increase odd ratio OR=21.233, [95% CI = 11.96, 37.69] and OR = 12.099, [95% CI = 6.56, 25.61] respectively. We equally observed a statistically significant association of alcohol drinks consumption and craving for non-food substances (Calabar clay) with anemia with increased odds ratio (OR = 2.08, [95% CI = 1.27, 3.43], $p = 0.004$ and OR = 4.643, [95% CI = 3.03, 7.12], $p = 0.0001$ respectively). Further, diagnosed cases of worm infection for the last 6 months were statistically significantly associated with anemia ($p = 0.004$). Additionally, age (18 – 26 years), diarrhea infection within the last 6 months, and gravid status among the pregnant women showed an increased odd ratio but were not statistically significantly associated with anemia Table 3 summarises the factors associated with anemia during pregnancy among women at the Buea Health District.

4. DISCUSSION

Anemia in pregnancy represents a life-threatening but preventable reason behind maternal and childhood morbidity and mortality

[4]. The health effects for the mother include fatigue, poor work capacity, impaired immune function, increased risk of cardiac diseases, and mortality [5-7]. Anemia in pregnancy is related to increased risk of Preterm birth and low birth weight babies [8,9], which are still the leading

causes of neonatal deaths in developing countries like Cameroon contributing to 30% of deaths [10]. This study was conducted to see the prevalence and factors related to persistent anemia among pregnant women within the Buea Health District, Cameroon.

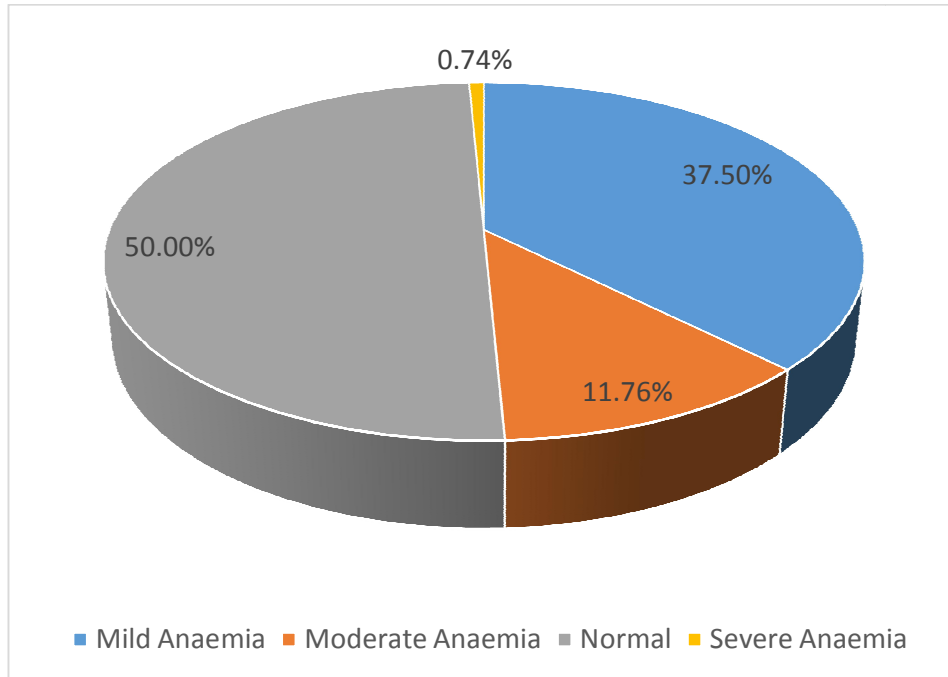


Fig. 1. Anemia severity status among pregnant women at the Buea Health District

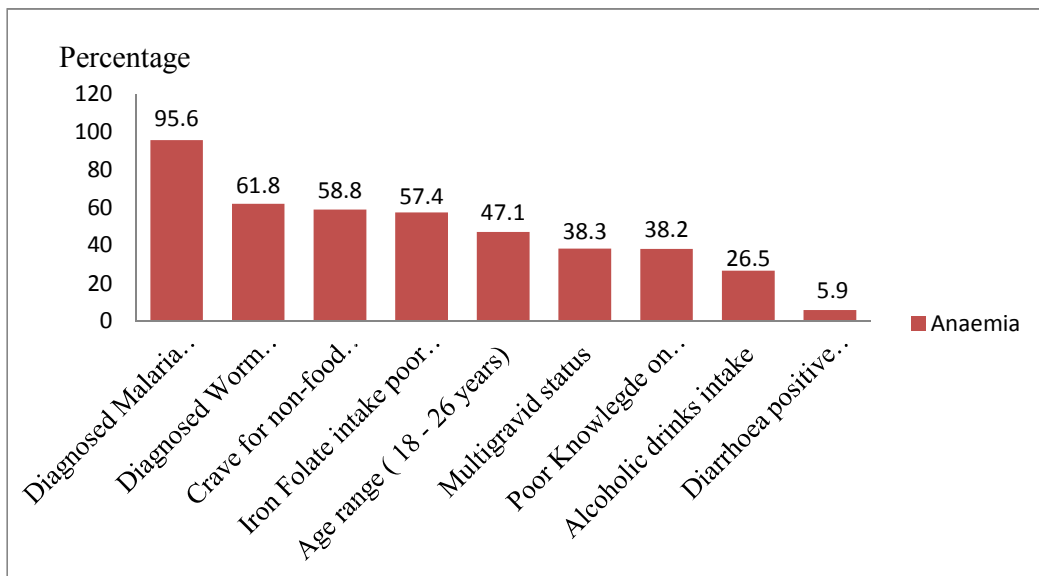


Fig. 2. Frequency of anemia with sociodemographic and clinical variables of pregnant women

Table 3. Multinomial logistic model of factors associated with Anemia during pregnancy among women at the Buea Health District

Variables	Parameters	n (%)	Odds Ratio (OR)	95% Confidence interval (CI)	p-Value
Age (years)	18 – 26	174 (42.6)	1.041	0.600 – 1.808	0.885
	27 – 35	162 (39.7)	0.628	0.359 – 1.097	0.102
	36 – 44 ^c	72 (17.6)	1.00		
Diarrhea (last 6 months)	Yes	18 (4.4)	2.063	0.759 – 5.606	0.156
	No ^c	390 (95.6)	1.00		
Iron folate Intake	Irregular	147 (36.0)	21.233	11.962 – 37.691	0.0001
	2-3 times/week	87 (21.3)	12.099	6.560 – 25.606	0.0001
	Regular ^c	174 (42.7)	1.00		
Diagnosed Worm infection (last 6 months)	Yes	279 (68.4)	0.538	0.352 – 0.823	0.004
	No ^c	129 (31.6)	1.00		
Diagnosed malaria (last 6 months)	Yes	393 (96.3)	0.657	0.229 – 1.880	0.433
	No ^c	15 (3.7)	1.00		
Alcohol intake	Yes	84 (20.6)	2.088	1.270 – 3.432	0.004
	No ^c	324 (79.4)	1.00		
Crave for non-food substance (Calabar clay)	Yes	168 (41.2)	4.643	3.029 – 7.116	0.0001
	No ^c	240 (58.8)	1.00		
Knowledge	Poor	159 (39.0)	0.940	0.631 – 1.400	0.761
	Good ^c	249 (61.0)	1.00		
Gravida status	Multigravid	165 (40.4)	1.002	0.616 – 1.629	0.993
	Secundigravid	135 (33.1)	1.397	0.841 – 2.322	0.197
	Primigravid ^c	108 (26.5)	1.00		

^c = comparing group

The prevalence of anemia in this study was 50%. When compared to previous studies, our value was higher than 39.8% and 49.3% reported by Tchente et al. [19], in Douala and Stevens et al. [7], in Cameroon as a whole respectively. The high prevalence of anemia in this current study may be because many pregnant women are not regularly or not even taking iron supplements and folic acid (iron and folate deficiencies), making them anemic. The high prevalence might also ensue to the fact that these pregnant women don't seem to be sleeping under impregnated mosquito nets or might be living around bushes, stagnant water, which provide a suitable environment for malaria infection and thus, they become anemic.

However, our prevalence observed during this study was less than the anemia prevalence of 68.9% reported within the general population of the Fako Division, Southwest Region, Cameroon [20], and 57% reported in the Buea Health District by Anchang-Kimbi et al. [18]. The low anemia prevalence during this current study may well be attributed to the relentless effort of the govt. to scale back malaria rates

through the distribution of insecticide-treated bed nets (ITNs) to each pregnant woman moreover as an intense sensitization campaign through media. Also, Iron deficiency accounts for more 50% reason behind anemia, maybe the haematinic supplementation by the govt. could account for the drop. Moreover, most of the pregnant women were responsive to the importance of taking iron supplements and folic acids.

In this study, the prevalence of anemia in pregnant women with worm infection was 68.4%. This high prevalence may be because they are not taking proper medications for the worm infection or are not aware they have worm infection and need proper treatment. The finding may be justified by the fact that these worms require iron for their growth and reproduction, they will feed on the body's iron-making these pregnant women to be iron deficient leading to a high prevalence of anemia.

Pregnant women with malaria infection had a high prevalence of 96.3% in this study. This prevalence is high compared to the study

performed by Mihiretie et al. [21] with a prevalence of 58.7%. Several justifications may be associated with high anemia among pregnant women. This high prevalence in this group of pregnant women maybe because they are not on any anti-malarial drug to treat malaria as the plasmodium feeds on RBCs thereby reducing the level of RBCs making the person anemic. Also because these pregnant women don't have insecticide-treated bed nets (ITNs) to sleep under or some have them but deliberately refuse to use them saying it causes too much heat.

Out of all anemic pregnant women; mild, moderate, and severe anemia accounted for 37.50%, 11.76%, and 0.74% respectively. This is somewhat lower than a study conducted by Mihiretie et al. [21].

It was observed during this study that no intake or reduce intake of iron folate frequency 2-3 times/week was statistically significantly related to anemia. We equally observed a statistically significant association of alcohol drink consumption and craving for non-food substances (Calabar clay) with anemia. Further, diagnosed cases of worm infection for the last 6 months were statistically significantly related to anemia. Additionally, age (18 – 26 years), diarrhea infection within the last 6 months, and gravid status among pregnant women were significantly related to anemia.

5. CONCLUSIONS

Anemia is still high among pregnant women in the Buea health district with an overall prevalence of 50%.

Factors including no intake or reduced intake of iron folate, alcohol drinks consumption, and craving for non-food substances (Calabar clay) and diagnosed worm infection within the last 6 months were all significantly associated with anemia among pregnant women.

CONSENT AND ETHICAL APPROVAL

The ethical clearance letter was obtained from the Biaka University Institute (BUIB) institutional review board. Administrative authorization was obtained from the South West Regional Delegate of Public Health. Informed consent was gotten from the women through a consent form and the aim of the study was clearly explained to all the participants.

ACKNOWLEDGEMENTS

The authors would like to thank all the participants who took part in this study. Also we are grateful to all the staffs of REGIONAL HOSPITAL BUEA, BOKWANGO INTEGRATED HEALTH CENTER (IHC), BUEA - ROAD IHC, BUEA TOWN IHC, MOLYKO IHC, and GREAT SOPPO IHC for their contributions towards the success of this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Balarajan Y, Ramakrishnan U, Ozaltin E, Shankar AH, Subramanian SV. Anemia in low-income and middle income countries. *Lancet*. 2011;378:2123-2135.
2. WHO/CDC. Worldwide Prevalence of Anemia 1993–2005: WHO Global Database on Anemia. Geneva, Switzerland: WHO Press; 2008.
3. WHO. The global prevalence of anemia in 2011. World Health Organization Geneva; 2015.
4. Menendez C, Fleming AF, Alonso PL. Malaria-related anemia. *Parasitology Today*. 2000;16(11):469–76.
5. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle income countries. *Lancet*. 2013;382(98): 427–451.
6. Mbule MA, Byaruhanga YB, Kabahenda M, Lubowa A. Determinants of anemia among pregnant women in rural Uganda., *Rural and Remote Health*. 2013;13(2): 2259.
7. Stevens GA, Finucane MM, De-Regil LM et al. Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anemia in children and pregnant and non-pregnant women for 1995–2011: a systematic analysis of population-representative data. *The Lancet Global Health*. 2013;1(1):E16–E25.
8. Msuya SE, Hussein TH, Uriyo J, Sam NE, Stray-Pedersen B. Anemia among pregnant women in northern Tanzania: prevalence, risk factors and effect on

- perinatal outcomes. Tanzania Journal of Health Research. 2011;13(1): 33–39.
9. Stephen G, Mgongo M, Hashim TH, Katanga J, Babill Stray-Pedersen B, Msuya SE. Anemia in pregnancy: Prevalence, risk factors, and adverse perinatal outcomes in Northern Tanzania. Anemia. 2018;9, Article ID 1846280. Available: <https://doi.org/10.1155/2018/1846280>
 10. Guyatt HL, Snow RW. Impact of malaria during pregnancy on low birth weight in sub-Saharan Africa. Clinical Microbiology Reviews. 2004;17(4):760–769.
 11. Chandra S, Tripathi AK, Mishra S, Amzarul M, Vaish AK. Physiological changes in hematological parameters during pregnancy. Indian Journal of Hematology and Blood Transfusion. 2012;28(3):144–146.
 12. Pavord S, Hunt B. The Obstetric Hematology Manual. Cambridge University Press, New York, NY, USA; 2018.
 13. WHO. Haemoglobin concentrations for the diagnosis of anemia and assessment of severity. Vitamin and Mineral Nutrition Information System: Geneva, World Health Organization; 2011. Available: <http://www.who.int/vmnis/indicators/haemoglobin.pdf>
 14. Toteja GS, Singh P, Dhillon BS, et al. Prevalence of anemia among pregnant women and adolescent girls in 16 districts of India. Food Nutrition Bulletin. 2006; 27(4):311–315.
 15. Wojtyła C, Biliński P, Paprzycki P, Warzocha K. Haematological parameters in postpartum women and their babies in Poland—comparison of urban and rural areas. Ann Agric Environ Med. 2011;18(2): 380–5.
 16. Fikir A. Prevalence of anemia and its associated factors among pregnant women receiving antenatal care at Aymiba Health Center, northwest Ethiopia. Journal of Blood Medicine. 2017;18
 17. World Health Organization. Global Health Observatory Data Repository/World Health Statistics; 2016. Available: <http://apps.who.int/gho/data/node.main.1?lang=en>
 18. Anchang Kimbi JK, Nkweti VN, Ntonifor HN, Apinjoh TO, Chi HF, Tata RB, Achidi EA. Profile of red blood cell morphologies and causes of anemia among pregnant women at first clinic visit in the mount Cameroon area: A prospective cross sectional study. BMC Research Notes. 2017;10:645. DOI: 10.1186/s13104-017-2961-6
 19. Tchente CN, Tsakeu END, Nguea AG, Njamen TN, Ekane GH, Priso EB. Prevalence and factors associated with anemia in pregnant women attending the General Hospital Douala. The Pan African Medical Journal. 2016;25:133. DOI:10.11604/pamj.04/11/201625.133.10610
 20. Achidi EA, Kuoh AJ, Minang JT, Ngum B, Achimbom BM, Motaze SC, Ahmadou MJ, Troye-Blomberg M. Malaria infection in pregnancy and its effects on haemoglobin levels in women from a malaria endemic area of Fako Division, South West Region, Cameroon. Journal of Obstetrics and Gynaecology. 2005;25(3): 235-240.
 21. Miliretie H, Fufa M, Mitiku A, Bacha C, Getahun D, Kejela M, Sileshi G, Wakshuma B. Magnitude of anemia and associated factors among pregnant women attending antenatal care in Nekemte Health Center, Nekemte, Ethiopia. Journal of Medical Microbiology and Diagnosis. 2015;4:197. DOI: 10.4172/21610703.1000197

© 2021 Ako et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/60708>